



Luanna Cambas, P.E.
LADOTD District 02 Lab Engineer

Jason Davis, P.E.
LADOTD Field Quality Assurance Administrator

MATERIALS AND TESTING

QUALITY ASSURANCE



QUALITY ASSURANCE

- What is Quality Assurance?
 - Why needed?
 - Sampling & Testing
 - 2059 Report
 - Typical Materials and Tests
- 



What?

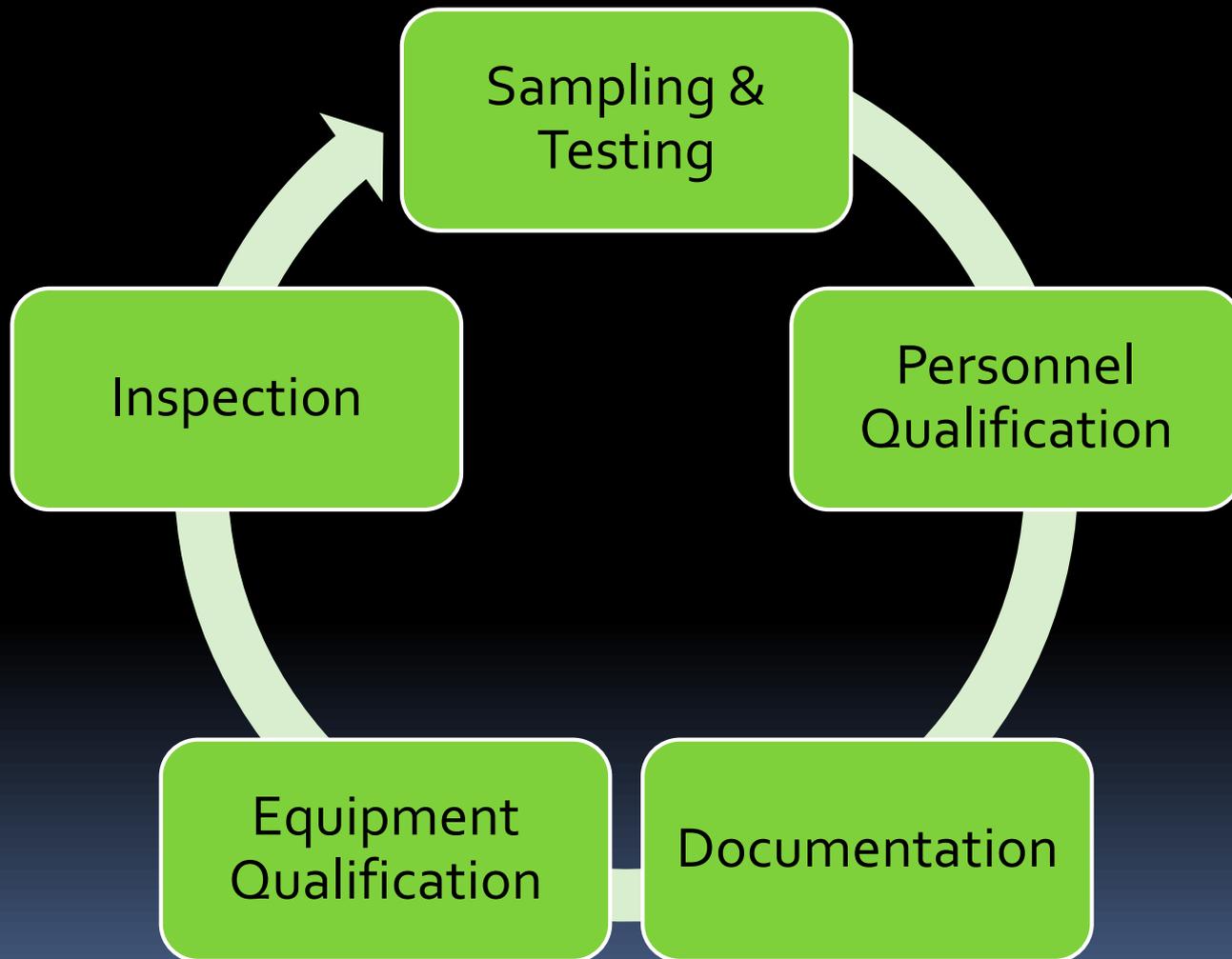
- A system for ensuring a desired level of **quality**.
 - 23 CFR 637 - “All those planned and systematic actions necessary to provide confidence that a product or service will satisfy given requirements for quality. “
- 



Why?

- To get what we pay for!
 - Required by the Code of Federal Regulations
- 

QUALITY ASSURANCE





SAMPLING & TESTING

- Acceptance Testing
 - Quality Control Testing
 - Verification Testing
 - Independent Assurance Testing
- 



ACCEPTANCE

- By DOTD (or Owner)
- To determine the degree of compliance with the specifications
- For acceptance of materials and/or the contractor's work.
- Pass/Fail or Pay Adjustment



QUALITY CONTROL

- By the contractor
 - To monitor, assess, and adjust material selection and production
 - To control the level of quality so that the product continuously conforms to specifications
- 



VERIFICATION

- For verifying procedures and equipment
 - For verifying material quality
 - Non-verifying results may warrant investigation and additional testing
- 

INDEPENDENT ASSURANCE

- Required by Feds
- Checks equipment and procedure.
- For making an independent random check on the *reliability of results*
- Can be Project-Basis or System-Basis
 - Project - Only on National Hwy Systems (NHS)
 - System – Proficiency Samples for all Testers



Quality Assurance Reference Manuals

- LA Standard Specs – Section 106
- Materials Sampling Manual
- Test Procedures Manual
- Qualified Products List (now Approved Producer/Supplier)
- Engineering Directives & Standards Manual, EDSM III.5.1.2

- 
- Construction Project is tied to these Quality Assurance Reference Documents by the **CONTRACT**

Creating a Sample ID

MATT

- Material Code
- Quantity
- Purpose Code
- Spec Code

SMM

- Material Code
- Quantity
- Sample Type
- Producer/Supplier
- Product Name

SMM Sample ID Basic Sample Data

 Maintain Sample Information

Basic Sample Data Addtl Sample Data Contract Other Tests

Smpl ID: d029c15BH080524	Status: Pending	
Revised By:	Revising:	Sample Date: 11/17/15
Link To:	Link From:	Date Entered: 11/17/15
Smpl Type: Acceptance	Acpt Meth: Test Results	
Material: 0302M00060	Stone, Class II	
Sampler: d0251	Barbier, Kevin	
P/S: Vulcan Materials Co-LaGrange,GA	APS00007410	
Type: Approved Manufacturer	City: LaGrange	
Prod Nm: StoneCII VulcanLaGrangeGA		
Mnfctr: Vulcan Materials Co-LaGrange,GA	APS00007410	
Town:	Geog Area: District 62	
Intd Use:		
Repr Qty: 1,000.000	LINEAR FOOT	Lab Control Number: CNd029c15BH080524
Auth By:	Auth Date: 00/00/00	Lab Reference Number: 02-211522
Lock Type: No Lock	Locked By:	Lock Date:



SMM ID – Add'l Sample Data

- Request by (PE Name)
 - Sample size
 - Mix ID (if required)
 - Plant ID (if required)
 - Other required info
 - Save
- 

SMM ID – Add'l Sample Data

Basic Sample Data	Add'l Sample Data	Contract	Other	Tests
Smpl ID: d029c15BH080524	Buy American: <input type="checkbox"/>			
Reqst By: <input type="text"/>				Witnessed By: <input type="text"/>
Smpl Size: <input type="text"/> N/A				
Depth: <input type="text"/> N/A				
Station: <input type="text"/>	Offset: <input type="text"/>			CS Log Mile: <input type="text"/>
Smpld From: <input type="text"/>				
Lift: <input type="text"/>	Zone: <input type="text"/>			
Design Type: N/A	Mix ID: <input type="text"/>			
Plant ID: <input type="text"/>				Plant Type: N/A
Creator User ID: <input type="text"/>				Sample Created from DWR <input type="checkbox"/>
Last Modified User ID: <input type="text"/>	Last Modified Date: 00/00/00			DWR Date: 00/00/00
				DWR Inspector: <input type="text"/>



SMM ID Contract Tab

- Click on little page icon
 - Right click on contract spot, search, and pick your contract
 - Quantity for whole project, not sample
 - Tie to Item Number
 - Call the DOTD Coordinator to get set up!
- 



SMM ID – Other & Tests

- Pick destination lab
 - Pick lab
 - Pick “default” or “more”
 - Save
 - Click print label icon
- 

MATERIALS SAMPLING MANUAL

- Used when...
 - Creating a Sampling Plan
 - Completing a Sample ID
 - Completing a 2059 Report
(Project Sample Summary)



SECTION 302 CLASS II BASE COURSE

MATERIAL	REF.	PURP.	SAMPLED BY	MIN. FREQ.	MIN. QUANT.	CER T.	SMALL QUANTITY	TYPICAL HANDLING TIME	REMARKS	
										TESTED BY
AGGREGATE BASES (cont'd)	302.01 Contractor	Quality Control	Contractor S 101	*	-----	-----	-----	-----	*Must test sufficient to ensure materials being delivered meet specification requirements.	
	302.02 Dist. Lab	Design*	Proj. Engr. S 101	1 per source	6 full sample sacks	-----	-----	4 days	(QPL 2) *For moisture-density relationsh	
	302.02 Dist. Lab	IA	Dist. Lab S 101	SEE INDEPENDENT ASSURANCE PROGRAM § 701.						

MATERIALS SAMPLING MANUAL



- **Arranged by Contract Item**
 - For example 502, Asphalt Concrete

- **The purpose**
 - For example -- acceptance, information, design, quality control, etc...

MATERIALS SAMPLING MANUAL

- Method of sampling



MATERIALS SAMPLING MANUAL



- **Minimum frequency of sampling**
 - For example -- 1/1000 Cubic Yards

- **Sample quantity (size)**
 - For example – 1 quart plastic bottle or 1 sack



MATERIALS SAMPLING MANUAL

- **Certificate requirements**
 - CA, CC, or CD
- **Distribution of documents**

REF.

MATERIAL

**TESTED
BY**

**AGGREGATE
BASES**

**Stone or
Crushed Slag**

**302.01
Contractor**

PURPOSE

**SAMPLED
BY**

**MIN.
FREQ.**

MIN. QUANT.

METHOD

CONTAINER

Quality
Control

Contractor
S 101

*

Design*

Proj. Engr.
S 101

1/source

6 full sample
sacks

CERT.

**SMALL
QUANTI
TY**

**TYPICAL
HANDLING
TIME**

REMARKS

DISTR.

*Must test sufficient to ensure materials being delivered meet specification requirements.

4 days

(QPL 2)

*For moisture-density relationships.

CERTIFICATES



- **CA** – Certificate of Analysis
 - Manufacturer test results
- **CC** – Certificate of Compliance
 - “We promise that we comply with specs.”
- **CD** – Certificate of Delivery
 - DOTD tested it, and it includes DOTD Lab Number (Not a bill of lading.)

Caribbean Cement Company Limited
Rockfort Plant, Kingston 2, Jamaica WI



**Certificate of Analysis for
Pozzolan**

Conducted by Caribbean Cement Company Limited
Complies with requirements of ASTM C 618 specifications, by weight, Class N

Date Analyzed: 4 September 2009

Client:

Item	ASTM C 618 Specifications, by weight, Class N (%)	CCCL Results (%)
SiO ₂	-	69.70
Al ₂ O ₃	-	15.54
Fe ₂ O ₃	-	3.88
CaO	-	3.45
Sum of Al ₂ O ₃ , Fe ₂ O ₃ & SiO ₂	70 Min	89.11
MgO	-	1.07
SO ₃	4.0 Max	1.12
Na ₂ O	-	5.44
K ₂ O	-	1.37
% Moisture	3.0 Max	1.67

P.T.O.

Note

1. Oxide analysis by X-ray fluorescence spectrometry
2. This report should not be reproduced except in its entirety

Cert. No: Pozz 09-09-2

STATE OF LOUISIANA
DEPARTMENT OF TRANSPORTATION AND DEVELOPMENT
MATERIALS & TESTING SECTION
5080 FLORIDA BLVD., BATON ROUGE, LA 70806

**CERTIFICATE OF COMPLIANCE
FOR
FLY ASH**

PROJECT NAME _____ P. O. NUMBER _____

PROJECT NUMBER _____ CONTRACTOR _____

CONCRETE PLANT _____ PLANT LOCATION _____

MANUFACTURER	MFG. LOCATION	PRODUCT SOURCE CODE	SUPPLIER	SUPPLIER LOCATION

FLY ASH CLASS	INTENDED USE	MODE OF SHIPPING	VEHICLE NO.	SEAL NO.	DATE SHIPPED	QUANTITY Mg (tons)

Note: LA DOTD specifications require an alkali content of 1.5% or less.

The undersigned certifies that the fly ash in this shipment has been manufactured under strict quality control and complies with the Louisiana Department of Transportation and Development specifications for the intended use and class of fly ash indicated above.

This certificate is invalid unless signed by an authorized representative of the company.

COMPANY: _____

**CERTIFICATE OF DELIVERY
FOR
EROSION CONTROL PRODUCTS
(QPL NO. 72)**

PROJECT NAME: _____ P.O. NUMBER: _____
PROJECT NUMBER: _____ CONTRACTOR: _____

SOURCE: _____

PRODUCT NAME	PROD SOURCE CODE	TYPE	MFR'S LOT NUMBER	DOTD LOT NUMBER (ex. 61-EC-0001)	DOTD LAB NUMBER	QUANTITY

Note: *A copy of the DOTD approved installation procedure for each product listed above shall accompany each shipment.*

Product Description:

This is to certify that the materials listed above have been shipped to the referenced project. We certify that these materials have been previously tested by the Louisiana DOTD Materials and Testing Section under the above referenced laboratory numbers and have met all specifications requirements for the designated project.

This certificate is invalid unless signed by an authorized representative of the company

COMPANY: _____



DISTRIBUTION of PAPERWORK

- **Code**
 - 1 Project Engineer receives one legible copy, reviews, approves and files for documentation.
 - 2 ...
 - 3 ...
- 



APPROVED PRODUCER/SUPPLIER QUALIFIED PRODUCTS LIST

- A listing of material *companies* which have been prequalified by DOTD.
 - This does not necessarily eliminate the requirement for testing.
 - This means that the company is *capable* of producing good material.
- 

Qualified Products List

PRODUCT SOURCE CODE	SOURCE	MATERIAL	APPROVED USES & FRICTION RATINGS ^{B-1}
OTHER AGGREGATE MATERIALS (continued)			
ABBJ	Lafarge Aggregates 730 Hwy 23 Calera, AL (Water Absorption = 0.4) (Spec. Gravity - SSD = 2.76)	Stone (Limestone)	1) Base & Surface Course 2) Asphaltic Surface Treatment 3) Asphaltic Concrete (Friction Rating = IV) 4) Portland Cement Concrete (excluding bridge decks) 5) Riprap & Stone Revetment
ABBW	Lafarge North America Three Rivers Quarry – Pit #1 830 Three Rivers Quarry Road Smithland, KY 42081 (Water Absorption = 0.89) (Spec. Gravity-SSD = 2.68)	Stone (Siliceous Limestone)	1) Base & Surface Course 2) Asphaltic Surface Treatment 3) Asphaltic Concrete (Friction Rating = III) 4) Portland Cement Concrete 5) Riprap & Stone Revetment

SMM Approved Producer/Supplier

Select Producer/Supplier

Selection

Producer/Supplier

Find :

Producer/Supplier

Producer/Supplier Code	Producer/Supplier Name	Producer/Supplier Type	Status
APS00000010	Ash Grove Cement Company - Forman, AR	Approved Manufacturer	Active
APS00000020	Ash Grove Cement Company - Midlothian, TX	Approved Manufacturer	Active
APS00000040	Buzzi Unicem USA Selma Plant - Festus, MO	Approved Manufacturer	Active
APS00000050	Buzzi Unicem USA - Cape Girardeau, MO	Approved Manufacturer	Active
APS00000060	Buzzi Unicem USA - New Orleans, LA	Approved Manufacturer	Active
APS00000070	Buzzi Unicem USA - Chattanooga, TN	Approved Manufacturer	Active
APS00000080	Buzzi Unicem USA - Pryor, OK	Approved Manufacturer	Active
APS00000090	Cementos Lima S.A. - Lima, Peru	Approved Manufacturer	Active

OK Cancel



Sampling Plan

- The Materials Sampling Manual is used to create a project-specific Sampling Plan based on the contract based on...
 - Materials Allowed and Selected
 - Each Contract Item Quantity
- 

Sampling Plan

State Project		742-26-0058		Sampling Plan			Page 5 of 58	
SECTION 302		Quantity		Minimum Sampling Frequency	Samples			Remarks
CLASS II BASE COURSE		Orig	Final		Req	Tkn	Cert	
ITEM # 302-02-D CLASS II BASE COURSE (12" THICKNESS)		2000.0		SQYD				
AGGREGATE BASES								
<u>STONE</u>								
	QC			SUFFICIENT	*		Meet requirements	
	DES			6 Full Sacks	1		QPL 2	
	ACC			1/1000 CY	2		QPL 2	
								1 Full Sack

2059 Report - PROJECT SAMPLE SUMMARY

- Cover Sheet with Signatures
- Sampling Plan with Final Tests and Quantities
- Matt System Printout
- Test Reports
- SMM 2059
- Certificates
- Job Mix Formulas
- Mix Designs

2059 Report Cover Sheet

- “All material used was in conformity with the contract, except...”
- Disposition of Failing Reports
 - Disposition Attached N/A
- Errors and Omissions
 - E & O Attached N/A

2059 Report – Matt Printout Summary of Test Results

- List of test results by type of material.
(printout from DOTD Matt system)
 - Date Sampled
 - Contract Item #
 - Quantity Represented
 - Test Results
 - Pass/Fail or % Pay



Private Lab

- Include a summary of test results taken from the Private Lab on the 2059!

(similar to the Matt system printout)



Disposition of Failing Results



- Any failing test result has to be explained. How did you resolve it?
 - “Material not used on project.”
 - “The stockpile was reworked. Subsequent samples passed. See lab #'s...”

Disposition of Failing Results

- “Material was accepted at 90% pay.”
- “PE determined it was acceptable for the intended use.”
- Do not say, “PE waived the sample.”



Errors & Omissions

- Explain why some materials were not sampled; why certificates were not obtained.
 - “Due to miscommunication no one was at the asphalt plant on May 9, 2012. Tests for lot 980 were not obtained.”
- 

Errors & Omissions



- “Inspector failed to get base density tests before the contractor poured the roadway. After a year, and varied and extreme weather conditions, the road is still performing very well. There are no signs of subsidence.”



Errors & Omissions

- “Although 20 concrete cylinders were required, only 15 were taken. Error was not realized until the end of the project. All acceptance samples and all of the contractor’s quality control samples met the compressive strength required.”
- 

2059 Report Process

- Signed by LPA PE
-  DOTD Lab Engineer
-  DOTD Area Engineer
-  LPA PE to be added to final close-out package

EDSM III.5.1.2 for Sampling

Go to - www.dotd.la.gov

Publications/Manuals

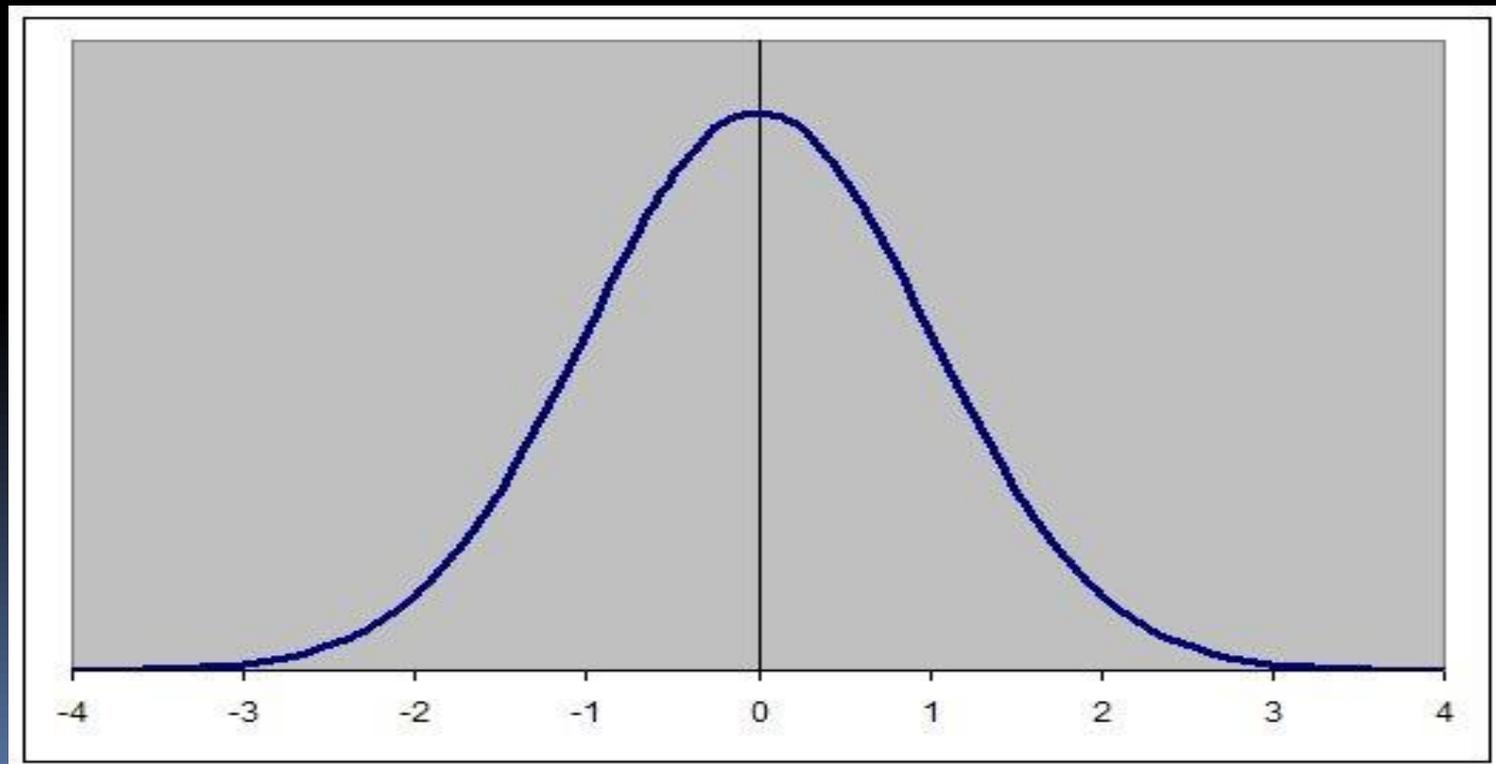
EDSM's

RANDOM SAMPLING

- We can't sample continuously.
- We take a few samples and make assumptions
- For these assumptions to be reasonably valid, we must sample randomly.
- Each choice must have an equal chance of being picked

With random samples, we can define our population, and make reasonable assumptions about the quality.

Normal Distribution





“Buy America” Provisions

- Some contracts say...all **steel and iron** materials, including **coating**, shall be manufactured in the United States.
 - There are some waivers – read the contract!
- 



Concrete & Asphalt

- DOTD District Lab
 - Certifies plants – 2 years

 - DOTD District Lab or LPA PE
 - Approves Asphalt Job Mix Formulas
 - Approves Concrete Mix Designs
- 

MATERIALS

- SOIL
- AGGREGATES
- CONCRETE
- ASPHALT

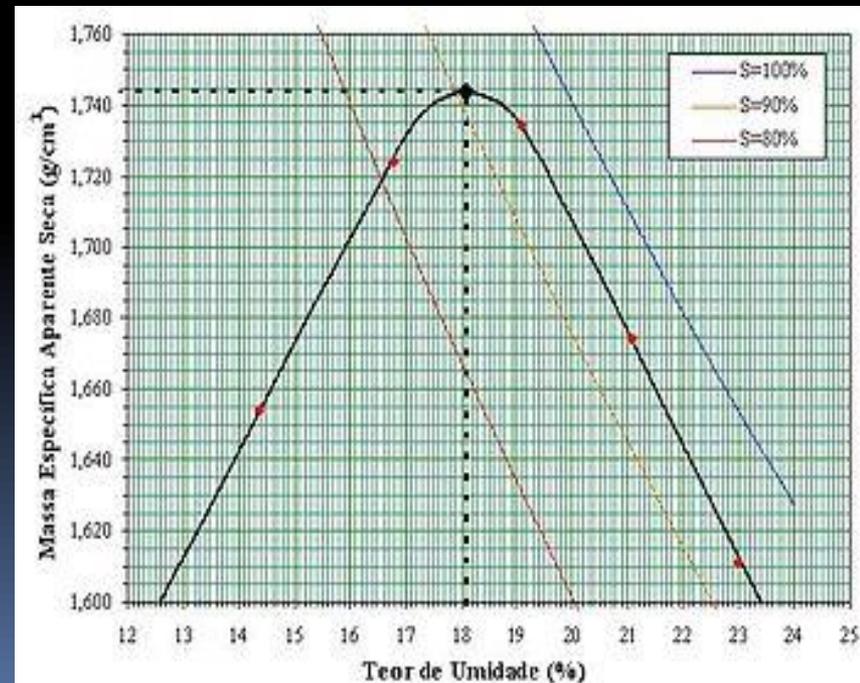


SOILS



- DISTRICT LAB
 - Soil Classification – (*where is it used?*)
 - Proctor

- FIELD
 - Density



AGGREGATES

- DISTRICT LAB
 - Gradation (*sample correctly!*)
- MATLAB
 - Source Approval
 - Soundness
 - Abrasion

(*Crushed concrete takes a long time!*)



CONCRETE

- DISTRICT LAB
 - Compressive Strength (cylinders)
- FIELD
 - Slump and Air
- MATLAB
 - Pavement Cores
 - Cement, Fly Ash, Admixtures



ASPHALT

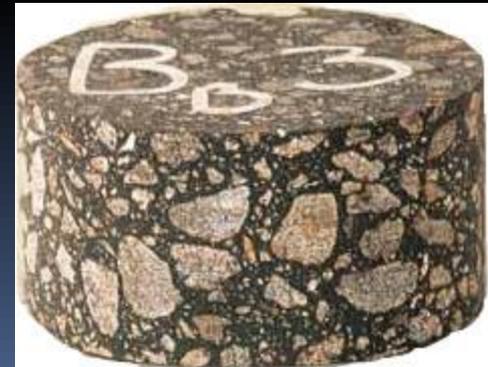


- DISTRICT
 - Viscosity for Asphalt Cement

- FIELD
 - Cores for Density
 - Smoothness, IRI = International Roughness Index

ASPHALT PLANT

- PLANT
 - Theoretical Maximum Specific Gravity (Rice Gravity, G_{mm})
 - Core for density
 - Gyrotory Briquette for Voids
(VMA, % G_{mm} at NI, NM, VFA)
- MATLAB
 - Asphalt Cement



SMOOTHNESS – Surface Tolerance

- Profiler to measure IRI





Surface Smoothness

- Inertial profiler (IRI) simulates the ride of a car. DOTD uses.
 - The Profile Index, (PI), measures from a horizontal plane.
 - Rolling straightedge is no longer used by the DOTD.
- 

QUALITY ASSURANCE

(In addition to Sampling and Testing and Documentation...)

- Inspection – a passing sample does not override a failing inspection!
- Personnel Qualification – Must be qualified to sample and to test
- Equipment Qualification – we certify haul trucks, concrete trucks, profilers, paving equipment, lab equipment, etc...

Materials Website



- www.dotd.la.gov
- Go to Construction
- Go to Materials

- Questions?
 - Luanna.Cambas@la.gov
 - Jason.Davis@la.gov